



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415**

April 19, 2012

Mr. John Ventosa, Site Vice President  
Entergy Nuclear Operations, Inc.  
Indian Point Energy Center  
450 Broadway, GSB  
P.O. Box 249  
Buchanan, NY 10511-0249

**SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT 2 - NRC INSPECTION REPORT  
05000247/2012008**

Dear Mr. Ventosa:

On March 8, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Indian Point Nuclear Generating Unit 2. The enclosed report documents the results of the inspection, which were discussed on March 8, 2012, with Mr. John Curry and members of your staff.

This inspection was an examination of license renewal activities under Temporary Instruction (TI) 2516/001, Review of License Renewal Activities. The inspection was directed toward those activities and facilities accessible during the refueling outage. The inspection also reviewed the completion of commitments made during the renewed license application process and compliance with the Commission's rules and regulations and the conditions of your operating license. Within these areas, the inspection involved examination of selected procedures and representative records, observations of activities, and interviews with personnel.

On the basis of the samples selected for review, there were no findings of significance identified during this inspection. The NRC staff identified two instances of commitments which could not be considered completed at this time. Given the scheduled completion of September 28, 2013, for these commitments, we will incorporate a followup review as a part of our planned team inspection in this area prior to September 28, 2013, to verify completion along with the completion of other commitments.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

Richard J. Conte, Chief  
Engineering Branch1  
Division of Reactor Safety

Mr. John Ventosa  
Site Vice President  
Entergy Nuclear Operations, Inc.  
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450 Broadway, GSB  
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Sincerely,  
/RA/

Richard J. Conte, Chief  
Engineering Branch1  
Division of Reactor Safety

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J. Ventosa

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Docket No. 50-247  
License No. DPR-26

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NRC Inspection Report 05000247/2012008

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Docket: 50-247

License: DPR-26

Report : 05000247/2012008

Licensee: Entergy Nuclear Northeast (Entergy)

Facility: Indian Point Nuclear Generating Unit 2

Location: Buchanan, NY

Dates: March 5 – 8, 2012

Inspectors: G. Meyer, Senior Reactor Inspector, Division of Reactor Safety  
M. Modes, Senior Reactor Inspector, Division of Reactor Safety

Accompanied By: K. Green, Senior Project Manager, Division of License Renewal  
W. Holston, Senior Technical Reviewer, Division of License Renewal

Approved By: Richard J. Conte, Chief  
Engineering Branch 1  
Division of Reactor Safety

## **SUMMARY OF FINDINGS**

IR 05000247/2012008; 03/05/2012 - 03/08/2012; Indian Point Nuclear Generating Unit 2;  
Review of License Renewal Activities.

The report covers a one week inspection of the implementation of license renewal activities during the Indian Point Unit 2 refueling outage. It was conducted by two region based engineering inspectors under Temporary Instruction 2516/001. No findings were identified. The inspectors determined that Entergy actions on four commitments (Commitments 28, 29, 34, and 36) were complete and met regulatory expectations as reflected in the staff's safety evaluation report. Inspection of two commitments (Commitments 2 and 3) concluded that additional inspection was needed.

## Report Details

### **4. OTHER ACTIVITIES (OA)**

#### **40A2 Other – License Renewal Activities (TI 2516/001)**

##### **a. Inspection Scope**

This inspection was performed by two NRC Region I based inspectors to evaluate the license renewal activities at the Indian Point Nuclear Generating Unit 2 in accordance with Temporary Instruction (TI) 2516/001. As noted in this TI: "This procedure was written to allow for timely verification by NRC inspectors that the applicant has made sufficient progress in implementing its license renewal commitments before entering its post-40-year license period and to allow documentation of these inspection activities while the operating license is being considered for renewal." This phase of the inspection is "to be completed during the outage preceding the beginning of the period of extended operations for the purpose of observing or verifying commitments of tests or other activities that require containment entries or access to rooms that would normally be posted as a high-radiation area or higher when the reactor is operating." The inspectors performed in-plant observations of license renewal related activities and sampled Entergy actions on commitments. The bases for the review was the NRC staff's safety evaluation report (NUREG-1930) and related licensee letters associated with licensee renewal regulatory commitments, including Letter NL-11-101, dated August 22, 2011.

##### **b. Findings and Observations**

No findings were identified.

##### **b.1 In-Plant Observations**

The inspectors observed ongoing activities and inspected the general condition of structures, systems, and components within the scope of license renewal. The inspectors performed reviews in the following areas, as related to commitments and aging management programs (AMPs):

- Turbine Building – Flow Accelerated Corrosion AMP
- Turbine Building – One-Time Inspection Program (Commitment 19)
- Station Blackout (SBO)/Appendix R Diesel Generator (Commitment 34)

The inspectors determined the general conditions to be satisfactory and the Entergy activities to be in accordance with facility programs and procedures.

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b.2 Commitments - Review Complete

Commitment 28 – Water Chemistry Control – Closed Cooling Water Program

Commitment 28 provides that Entergy will “Enhance the Water Chemistry Control – Closed Cooling Water Program to maintain water chemistry of the IP2 SBO/Appendix R diesel generator cooling system per EPRI guidelines” and will “Enhance the Water Chemistry Control – Closed Cooling Water Program to maintain the IP2 and IP3 security generator and fire protection diesel cooling water pH and glycol within limits specified by EPRI guidelines” by September 28, 2013. The license renewal team inspection (Report 05000247/2008006 dated August 1, 2008) had noted that some parameters were not monitored for some diesels in existing procedures.

The inspectors reviewed the implementation plan, EPRI guidelines, revised chemistry sampling procedures and acceptance criteria, and chemistry results for the SBO/App. R, fire protection, and security diesels.

The inspectors concluded that Commitment 28 had been completed.

Commitment 29 – Sulfates in the Refueling Water Storage Tank (RWST)

Commitment 29 provides that Entergy will “Enhance the Water Chemistry Control – Primary and Secondary Program for IP2 to test sulfates monthly in the RWST with a limit of <150 ppb” by September 28, 2013.

The inspectors reviewed the implementation plan, RWST chemistry sampling procedure, and RWST chemistry results for 2010 and 2011.

The inspectors concluded that Commitment 29 had been completed.

Commitment 34 – Station Blackout (SBO)/Appendix R Diesel Generator

Commitment 34 provides that “IP2 SBO/Appendix R diesel generator will be installed and operational by April 30, 2008.”

Inspection Report 05000247/2008006, dated August 1, 2008, documented the license renewal team inspection of the IP2 SBO/App. R diesel generator following its installation and operational testing. Inspection Report 05000247/2008003, dated August 13, 2008, documented the inspection of the post-modification testing of this diesel generator.

The inspectors concluded that Commitment 34 had previously been completed.

Commitment 36 – Refueling Cavity Concrete

Commitment 36 provides that Entergy will “Perform a one-time inspection and evaluation of a sample of potentially affected IP2 refueling cavity concrete prior to the period of extended operation. The sample will be obtained by core boring the refueling cavity wall in an area that is susceptible to exposure to borated water leakage. The inspection will

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include an assessment of embedded reinforcing steel. A sample of leakage fluid will be analyzed to determine the composition of the fluid." These actions are scheduled for completion by September 28, 2013. Commitment 36 also addresses core bores and leakage fluid analysis in the first ten years of the period of extended operation. During refueling operations at Unit 2, leakage through the reactor refuel cavity liner plate had caused the cavity flood-up water to migrate through the concrete walls of the cavity. NRC was concerned the borated water flowing through the concrete and past the reinforcement bars could cause an indeterminate degradation.

The inspectors reviewed the test results of concrete cores removed from the IP2 refuel structure in Engineering Report No. IP-RPT-11-00002, Assessment of Concrete Aging From Selected Indian Point Structures, Rev 0, January 10, 2011. The originally specified concrete strength, per United Engineers and Constructors Drawing 9321-01-5-1, Specification for Design, Inspection and Tests of Concrete, High Strength Bolts, Compaction of Fill and Rock Bearing, was 3000 psi at 28 days. Entergy took seven core samples from the Unit 2 fuel pool structure; the compression results were 7,213 psi, 3,202 psi, 5,890 psi, 6,294 psi, 8,307 psi, 5,497 psi, and 6,448 psi. Using the guidance of American Concrete Institute, ACI 214.4R, the calculated equivalent in-structure compressive strength was 4,341 psi.

Reinforcing bars were part of three of the concrete samples taken from the Unit 2 fuel pool structure. The above referenced report noted there was no visible degradation of the reinforcing bars. This observation compared favorably with concrete core samples taken from the Unit 1 fuel pool structure, which was wetted by a boric acid solution equivalent to Unit 2 for approximately 30 years.

Nine samples were taken from the core bores for further interrogation by Petrography with a Stereo-microscope. These samples were examined in general accordance with ASTM C-856-04, Standard Practice for Petrographic Examination of Hardened Concrete. There were observations of concrete paste discoloration and cracks noted in the Petrographic samples taken from the core samples extracted from the west and south walls of the fuel pool. The discoloration was attributed to the differences in the hydration of the paste most likely due to exposure to the water through the cracks, and the report concluded the examined material was of "relatively good quality."

The inspectors concluded that Commitment 36 is on track to be completed.

### b.3 Commitments – Needing Additional NRC Review

#### Commitment 2 – Bolting Integrity Program

Commitment 2 provides that Entergy will "Enhance the Bolting Integrity Program for IP2 and IP3 to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC and clarify that prohibition on use of lubricants containing MoS<sub>2</sub> for bolting" by September 28, 2013. Commitment 2 also states that "The Bolting Integrity Program manages loss of preload and loss of material for all external bolting."

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The inspectors reviewed the implementation plan and the revised mechanical fastener procedure, which had specific instructions on bolting regarding the use of actual yield strength and the prohibition against molybdenum disulfide as a lubricant. Nonetheless, there was no planned action regarding the second commitment statement regarding loss of preload and loss of material, despite Commitment 2 being considered completed by Entergy. Entergy entered this concern into the license renewal corrective action system as item LO-LAR-2011-00174, CA-66.

The inspectors concluded that the specific procedural instructions of Commitment 2 had been completed, but that review of any action on the general statement needed to be reviewed during a subsequent NRC inspection.

### Commitment 3 – Buried Piping and Tanks Inspection Program

Commitment 3 provides that Entergy will "Implement the Buried Piping and Tanks Inspection Program for IP2 [and IP3] as described in LRA Section B.1.6" and perform the following:

- "Include in the Buried Piping and Tanks Inspection Program described in LRA Section B.1.6 a risk assessment of the in-scope buried piping and tanks that includes consideration of the impacts of buried piping or tank leakage and of conditions affecting the risk for corrosion."
- "Classify pipe segments and tanks as having a high, medium or low impact of leakage based on the safety class, the hazard posed by fluid contained in the piping and the impact of leakage on reliable plant operation."
- "Determine corrosion risk through consideration of piping or tank material, soil resistivity, drainage, the presence of cathodic protection and the type of coating."
- "Establish inspection priority and frequency for periodic inspections of the in-scope piping and tanks based on the results of the risk assessment."
- "Perform inspection using inspection techniques with demonstrated effectiveness."

The inspectors reviewed the implementation plan and Entergy fleet, corporate engineering and site engineering procedures. The inspectors also reviewed a summary report of inspection results, cathodic protection records, and area potential earth current (APEC) survey results.

The inspectors reviewed the risk assessment, classifications of leakage impacts, and corrosion risk categorizations addressed in the first three bulleted items above, and found the evaluation approaches to be sound and generally credible. The inspectors reviewed the inspection plan based on these evaluations to be reasonable and appropriate. The inspectors reviewed a sample of inspection records, which showed that inspections had involved direct visual inspection, followed by external ultrasonic test (UT) inspections in some cases, and were thorough and appropriate.

The inspectors noted two concerns. First, site engineering procedure SEP-UIP-IPEC stated that guided wave inspection was an acceptable indirect inspection technique.

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The inspectors noted that while guided wave inspection was a credible method to inform other inspections, it did not meet the "demonstrated effectiveness" standard and was not suitable for inspection by itself. There was no evidence that guided wave inspection had been solely used to accept inspected piping or tanks, but the procedure merited clarification on the use of guided wave inspection. Second, Entergy fleet procedure EN-DC-343 listed the affected Unit 2 underground systems in Attachment 9.2, but omitted the river water, circulating water, and containment isolation support systems. There was no immediate impact on the inspection plan given that these actions were not in effect without a renewed license. However, Entergy will review this matter and they entered these two concerns into the license renewal corrective action system as item LO-LAR-2011-00174, CA-67.

Given the preliminary progress on Commitment 3, the inspectors determined that additional inspection was merited on the clarification of the use of guided wave inspection, coverage of omitted underground systems, and subsequently completed inspections.

#### b.4 Annual Updates

10 CFR 54.21(b) requires each year following submittal of the license renewal application and at least three months before scheduled completion of the NRC review, an amendment to the renewal application be submitted that identifies any change to the current licensing basis (CLB) of the facility that materially affects the contents of the license renewal application, including the Updated Final Safety Analysis Report (UFSAR) supplement. The inspectors selected a sample from annual update submittals for review.

Amendment 8 to the application transmitted by a letter (NL-09-060) dated May 15, 2009. This amendment was a result of a review of documents affecting the current license basis during the period May 1, 2008 through March 1, 2009, since the prior annual update amendment. The review concluded that sections of the application were affected by changes to the current licensing basis. For example, during this period, the Indian Point 3 Security Diesel was replaced, affecting Section 3.3.2.1.15 and Table 3.3.3-15-IP3 of the application.

This example illustrated Entergy Nuclear Operations, Inc. compliance with 10 CFR 54.21(b).

#### Summary

No findings were identified and general conditions in the plant areas observed were satisfactory. The inspectors determined that Entergy actions on four commitments (Commitments 28, 29, 34, and 36) were complete and met regulatory expectations as reflected in the staff's safety evaluation report. Inspection of two commitments (Commitments 2 and 3) concluded that additional inspection was needed. Further NRC inspection of Unit 2 commitments, including Commitments 2 and 3, is planned prior to the scheduled completion date of September 28, 2013.

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4OA6 Exit Meeting

The inspectors presented the inspection results to Mr. John Curry, License Renewal Project Manager, and other members of the staff on March 8, 2012. The inspectors confirmed that no proprietary material was examined during the inspection.

ATTACHMENT: SUPPLEMENTAL INFORMATION

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**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Licensee Personnel

J. Curry, License Renewal Team Project Manager  
N. Azevedo, Supervisor, Supervisor Engineering Programs  
C. Caputo, License Renewal Team  
G. Dahl, Licensing Engineer  
R. Drake, System Engineer  
J. Flagg, License Renewal Team  
D. Lach, License Renewal Team

**LIST OF DOCUMENTS REVIEWED**

General

NUREG-1930, Safety Evaluation Report Related to the License Renewal of Indian Point  
Nuclear Generating Unit Nos. 2 and 3, November 2009  
NUREG-1930, Safety Evaluation Report Related to the License Renewal of Indian Point  
Nuclear Generating Unit Nos. 2 and 3, Supplement 1, August 30, 2011  
Entergy Letter NL-11-101, Clarification for Request for Additional Information (RAI), dated  
August 22, 2011

In-plant Observations

One-Time Inspection Matrix (draft)  
One-Time Inspection Form 169473-01  
One-Time Inspection Form 51282477-01  
WO 00255920, FAC UT of heater drain piping  
WO 00255936, FAC UT of reheater drain piping

Commitment 2 (Bolting Integrity)

IP-RPT-11-LRD03, Review of the Bolting Integrity AMP for Implementation, Rev 0 (draft)  
O-MS-411, Torquing of Mechanical Fasteners, Rev 3

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Commitment 3 (Buried Piping and Tanks Inspection)

IP-RPT-11-LRD07, Review of the Buried Pipe and Tanks Inspection AMP for Implementation, Rev 0 (draft)  
EN-DC-343, Underground Piping and Tanks Inspection and Monitoring Program, Rev 4  
CEP-UPT-0100, Underground Piping and Tanks Inspection and Monitoring, Rev 0  
SEP-UIP-IPEC, Underground Components Inspection Plan, Rev 0  
PCA Engineering Inc, Cathodic Protection System Maintenance Record Sheet,  
AFW Pump Room Annex - Unit 2, PCA Job No. 30493, 2/28/12  
IP-RPT-11-0045, Indian Point Energy Center APEC Survey, 11/17/11  
IPEC Underground Piping and Tank Program Completed Buried Pipe Inspections, 1/11/12  
Thielsch Engineering, Laboratory Testing Data Sheet, 12/12/11  
Photographs of Nov/Dec 2011 inspections of IP2 24" SRW lines 409  
(16 pictures dated 11/23/11) and 408 (24 pictures dated 11/23/11)  
IP2-UT-11-050, UT Erosion Corrosion Exam – 24 SRW line 409, 12/28/11  
IP2-UT-11-048, UT Erosion Corrosion Exam – 24 SRW line 408, 12/28/11, 2 pictures  
Inspection Report, IP3 AFW/Cond Return to CST (8" line 1080), WO 279578-03, 12/9/11,  
4 pictures  
Inspection Report, IP3 CST Supply to AFW Pumps (12" line 1070), WO 279578-03, 12/9/11,  
4 pictures  
IP3-UT-11-076, UT E/C Examination IP3 8" line 1080, 12/15/11  
IP3-UT-11-077, UT E/C Examination IP3 12" line 1070, 12/15/11

Commitment 28 (Water Chemistry – Closed Cooling)

EPRI TR-107396, Closed Cooling Water Chemistry Guideline, Rev 1  
IP-RPT-11-LRD41, Review of the Water Chemistry- Closed Cooling Water AMP for  
Implementation, Rev 0 (draft)  
0-CY-2510, Closed Cooling Water Chemistry Specifications and Frequencies, Rev 13  
IP2 SBP/App R diesel quarterly chemistry results, March 2008 to January 2012  
IP2 Fire pump diesel quarterly chemistry results, January 2007 to December 2011  
IP2 Security diesel quarterly chemistry results, January 2007 to December 2011

Commitment 29 (RWST Sulfates)

IP-RPT-11-LRD42, Review of the Water Chemistry - Primary and Secondary AMP for  
Implementation, Rev 0 (draft)  
2-CY-2625, General Plant Systems Specifications and Frequencies, Rev 16  
IP2 RWST monthly chemistry results, January 2010 to February 2012

Commitment 36 (Refueling Cavity Concrete)

ER No. IP-RPT-11-00002, Assessment of Concrete Aging From Selected Indian Point  
Structures, Rev 0  
United Engineers and Constructors Drawing 9321-01-5-1, Specification for Design, Inspection  
and Tests of Concrete, High Strength Bolts, Compaction of Fill and Rock Bearing  
ASTM C-856-04, Standard Practice for Petrographic Examination of Hardened Concrete

**LIST OF ACRONYMS**

ADAMS	Agencywide Documents Access and Management System
AMP	Aging Management Program
CLB	Current Licensing Basis
EPRI	Electric Power Research Institute
LRA	License Renewal Application
NRC	U. S. Nuclear Regulatory Commission
RFO	Refueling Outage
RWST	Refueling Water Storage Tank
SBO	Station Blackout
TI	Temporary Instruction
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Test